07-07-00

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Case Docket No. PHF 99,593

THE COMMISSIONER OF PATENTS AND TRADEMARKS, Washington, D.C. 20231

Enclosed for filing is the patent application of Inventor(s):
JOAN LLACH-PINSACH, PHILIPPE SALEMBIER

For: AUTOMATIC EXTRACTION METHOD OF THE STRUCTURE OF A VIDEO SEQUENCE

ENCLOSED ARE:

[X] Associate Power of Attorney;
[ ] Information Disclosure Statement, Form PTO-1449 and copies of documents listed therein;
[X] Preliminary Amendment;
[X] Specification (12 Pages of Specification, Claims, & Abstract);
[X] Declaration and Power of Attorney:
(1 Pages of a [ ]fully executed [X]unsigned Declaration);
[X] Drawing (6 sheets of [ ]informal [X]formal sheets);
[X] Certified copy of EUROPEAN application Serial No. 99101684.8;
[X] Other: AUTHORIZATION PURSUANT TO 37 CFR 1.136(a)(3);
[X] Other: CITATION OF RELATED CASES;
[ ] Assignment to .

FEE COMPUTATION

CLAIMS AS FILED				
FOR	NUMBER FILED	NUMBER EXTRA	RATE	BASIC FEE - 690.00
Total Claims	8 - 20 =	0	X $18 =	0.00
Independent Claims	2 - 3 =	0	X $78 =	0.00
Multiple Dependent Claims, if any			$260 =	0.00
TOTAL FILING FEE			=	$690.00

Please charge Deposit Account No. 14-1270 in the amount of the total filing fee indicated above, plus any deficiencies. The Commissioner is also hereby authorized to charge any other fees which may be required, except the issue fee, or credit any overpayment to Account No. 14-1270.

[ ]Amend the specification by inserting before the first line the sentence: --This is a continuation-in-part of application Serial No. , filed .--.

CERTIFICATE OF EXPRESS MAILING

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of Atty. Docket

JOAN LLACH-PINSACH ET AL PHF 99,593

Serial No. Group Art Unit

Filed: CONCURRENTLY Ex.

AUTOMATIC EXTRACTION METHOD OF THE STRUCTURE OF A VIDEO SEQUENCE

Honorable Commissioner of Patents and Trademarks
Washington, D.C. 20231

PRELIMINARY AMENDMENT

Sir:

Prior to calculation of the filing fee and examination, please amend the above-identified application as follows:

IN THE CLAIMS

Please amend the claims as follows:

Claim 3. (amended) A method according to [anyone of claims 1 and 2] claim 1, wherein said sub-division step uses a criterion involving the level of homogeneity on the motion parameters of the camera used to generate the processed video sequence.

REMARKS

The claims have been amended to delete multiple dependencies.

Entry of this amendment is respectfully requested.

Respectfully submitted,

By _____
Michael E. Marion, Reg. 32,266
Attorney
(914) 333-9641

Automatic extraction method of the structure of a video sequence

FIELD OF THE INVENTION

The invention relates to a method for an automatic extraction of the structure of a video sequence that corresponds to successive frames. The invention also relates to a method for indexing data that includes said definition method, to a device for carrying out said indexing method, and to an image retrieval system in which said method is implemented. This invention will be very useful in relation with the MPEG-7 standard.

BACKGROUND OF THE INVENTION

The future MPEG-7 standard is intended to provide a flexible and extensible framework for defining a standard set of descriptors that can be used to describe various types of multimedia documents. The description thus associated with a given content allows fast and efficient searching for material of a user's interest. The invention relates more specifically to the case of representation of video sequences.

A video sequence is a series of sequentially ordered images (in time). Prior to its storage in a database, the corresponding videostream is segmented into elementary units (or shots, a shot being a sequence of contiguous frames generated during a continuous operation and representing a continuous action in time and space), that are then identified and indexed. A video indexing technique is described for instance in the document "Automatic video indexing via object motion analysis", J.D. Courtney, Pattern Recognition, volume 30, number 4, April 1997, pp.607-625. As explained in said document, the logical organization of video sequences may be determined by means of a hierarchical segmentation, in the same manner a text is subdivided into chapters and paragraphs. However, in many cases, this temporal segmentation seems to be not completely appropriate, for instance in applications such as sport (soccer, tennis games) where video shots can be very long.

SUMMARY OF THE INVENTION

It is an object of the invention to propose a method that is able to automatically create the description of a video sequence, that is to say a table of contents of said sequence, on the basis of a new, specific criterion.

To this end, the invention relates to a method such as described in the introductory paragraph of the description and which moreover comprises :

(1) a shot detection step, provided for detecting the boundaries between consecutive shots, a shot being a set of contiguous frames without editing effects ;

(2) a partitioning step, provided for splitting each shot into sub-entities, called micro-segments ;

(3) a clustering step, provided for creating a final hierarchical structure of the processed video sequence.

Such a method allows to obtain a partition of each shot of the processed video sequence into temporal sub-entities, here called micro-segments. Preferably, these micro-segments present, according to the proposed criterion, a high level of homogeneity on the motion parameters of the camera with which the original images have been captured (these images having been converted into a video bitstream that constitutes said processed video sequence).

More precisely, the homogeneity of each micro-segment is computed on a motion histogram, each bin of which shows the percentage of frames of the sequence with a specific type of motion. A micro-segment is perfectly homogeneous when it presents a single combination of camera motion parameters along all its frames, the histogram bins then being equal to 1 or 0. On the contrary, if the bins of the histogram are not equal to either 1 or 0, i.e. present intermediate values indicating that a micro-segment is not perfectly homogeneous, in order to segment a shot, a distance between two segments is computed, based on the homogeneity of the segments union. Said homogeneity is itself deduced from the histogram of a micro-segment and the different motion types, the homogeneity of a shot being equal to the homogeneity of its micro-segments weighted by the length of each of them, a fusion between any pair of segments being decided or not according to the value of the homogeneity of the shot with respect to a predefined threshold T(H) and assuming that the selected segments have already been merged, and such a possible merging process between micro-segments ending when there is no further pair of neighbouring micro-segments that can be merged.

It is another object of the invention to propose a video indexing device including means for carrying out such a method and associated indexing means for adding a label to each element of the hierarchical structure defined thanks to this method.

It is still another object of the invention to propose an image retrieval system including such a video indexing device and associated means for performing on the basis of

the categorization issued from said indexing operation any image retrieval using one or several features of this image.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will now be described, by way of example, with reference to the accompanying drawings in which :

- Fig.1 shows a block diagram of the definition method according to the invention ;
- Fig.2 illustrates an example of mDFD curve for a given sequence of frames ;
- Fig.3 shows an example of histogram illustrating the measure of the segment homogeneity ;
- Fig.4 illustrates the process of initial oversegmented partition creation ;
- Fig.5 shows a binary tree such as created by implementation of a shot merging sub-step provided in the definition method according to the invention ;
- Fig.6 shows the tree yielded after a tree restructuring sub-step ;
- Fig.7 illustrates a method for indexing data that have been processed according to the invention ;
- Fig.8 illustrates an image retrieval system implementing said indexing method and allowing, thanks to appropriate associated means, to perform an image retrieval based on the categorization issued from such an indexing operation.

DETAILED DESCRIPTION OF THE INVENTION

The goal of a table of contents for a video sequence is to define the structure of this sequence in a hierarchical fashion, like in a text document. The original sequence is therefore subdivided into sub-sequences which can also be divided into shorter sub-sequences. At the end of this division process, the shortest entity to be described will be the micro-segment.

More precisely, the method according to the proposed strategy is divided into three steps, which are, as shown in Fig.1 : a shot detection step 11 (in a sequence of pictures, a video shot is a particular sequence which shows a single background, without editing effects such as cuts, which define a sharp transition, wipes, which correspond to a sliding window effect, mates, which let a dark blob invade the frames, dissolves, which represent a gradual change from one camera record to another one by linear combination of the frames, and so on), a partitioning step 12 of the detected shots, and a shot clustering step 13.

The first step 11 is provided for splitting the input video sequence into shots constituting the input data for the next steps. This step must allow to detect the transitions between consecutive shots, which is made by means of two main sub-steps : a computation sub-step 111, allowing to determine a mean Displaced Frame Difference (mDFD) curve, and a segmentation sub-step 112.

The mDFD curve computed during the sub-step 111 is obtained taking into account both luminance and chrominance information. With, for a frame at time t, the following definitions :

$$\text{luminance } Y = \{f_k(i,j,t)\}_{k=Y} \quad (1)$$

$$\text{chrominance components } (U,V) = \{f_k(i,j,t)\}_{k=U,V} \quad (2)$$

the DFD is given by :

$$DFD_k(i,j\,;t-1,t+1) = f_k(i,j,t+1) - f_k(i-d_x(i,j), j-d_y(i,j), t-1) \quad (3)$$

and the mDFD by :

$$mDFD(t) = \frac{1}{I_x I_y} \sum_{k}^{Y,U,V} w_k \sum_{i,j}^{I_x,I_y} \left| DFD_k(i,j\,;t-1,t+1) \right| \quad (4)$$

where I_x, I_y are the image dimensions and w_k the weights for Y, U, V components. An example of the obtained curve (and of the corresponding filtered one), showing ten shots s_1 to s_{10}, is illustrated in Fig.2 with weights that have been for instance set to $\{w_Y, w_U, w_V\} = \{1, 3, 3\}$. The transitions between consecutive shots can be abrupt changes from one frame to the following one, or more sophisticated, like dissolves, fades, and wipes : the highest peaks of the curve correspond to the abrupt transitions (frames 21100, 21195, 21633, 21724), while, on the other side, the oscillation from frame 21260 to frame 21279 corresponds to a dissolve and the presence of large moving foreground objects in frames 21100-21195 and 21633-21724 creates high level oscillations of the mDFD curve.

The sub-step 112, provided for detecting the video editing effects and segmenting the mDFD curve into shots, uses a threshold-based segmentation to extract the highest peaks of the mDFD curve (or another type of mono-dimensional curve). Such a technique is described for instance in the document "Hierarchical scene change detection in an MPEG-2 compressed video sequence", T.Shin and al, Proceedings of the 1998 IEEE International Symposium on Circuits and Systems, ISCAS'98, vol.4, March 1998, pp.253-256.

The partitioning step 12 is a temporal segmentation provided for splitting each detected shot into sub-entities called micro-segments. This temporal segmentation step,

applied to each detected shot separately, consists of two sub-steps : an oversegmentation sub-step 121, intended to divide each shot into so-called microsegments which must show a perfect homogeneity, and a merging sub-step 122.

In order to carry out the first sub-step 121, it is necessary to define first what is called a distance (the distances thus defined will allow to compare the micro-segments), and also a parameter allowing to assess the quality of a micro-segment or a partition (= a set of micro-segments). In both cases, a motion histogram, in which each one of the bins shows the percentage of frames with a specific type of motion and which is defined as indicated by the following relation (5), is used :

$$H_s[i] = \frac{N_i}{L_s} \qquad (5)$$

where s represents the label of the concerned micro-segment inside the shot, i the motion type (these motions are called trackleft, trackright, boomdown, boomup, tiltdown, tiltup, panleft, panright, rollleft, rollright, zoomin, zoomout, fixed), L_s the length of said concerned micro-segment s, and N_i the number of frames of the micro-segment s with motion type i (it is possible that $\sum H_s[i] > 1$, since different motions can appear concurrently).

A micro-segment is assumed to be perfectly homogeneous when it presents a single combination of camera motion parameters along all its frames, or to be not homogeneous when it presents important variations on these parameters. The micro-segment homogeneity is computed on its histogram (relation (5)) : if a micro-segment is perfectly homogeneous, the bins of its histogram are equal either to 0 (the considered motion does not appear at all) or to 1 (the motion appears on the whole micro-segment), while if it is not, the bins of the histogram present intermediate values. The measure of the micro-segment homogeneity is then obtained by measuring how much its histogram differs from the ideal one (i.e. it is computed how much the bins of the histogram differ from 1 or 0). The distance corresponding to bins with high values is the difference between the bin value and 1 ; analogously, for bins with small values, the distance is the bin value itself. An example of histogram is shown in Fig.3, the axes of which indicate for each motion type its proportion (= motion presence) : two motion types introduce some error because the motion does not appear in all the frames of the micro-segment (panleft PL and zoomin ZI), and two other ones (boomdown BD and rollright RR) introduce some error for the opposite reason.

Mathematically, the homogeneity of a micro-segment s is given by the relation (6) :

$$H(s) = \sum_{i} e(i) \quad (6)$$

where : $e(i) = 1 - H_s[i]$ if $H_s[i] \geq 0,5$

$e(i) = H_s[i]$ if $H_s[i] < 0,5$

$Hs[i]$ = histogram of the micro-segment s

i = motion type.

The homogeneity of a shot S is then equal to the homogeneity of its micro-segments, weighted by the length of each of them, as illustrated by the following equation (7) :

$$H(S) = \frac{1}{L(S)} \cdot \sum_{j=1}^{j=N} L_j \cdot H(s_j) \quad (7)$$

where $L(S) = \sum_{1}^{N} L_j$ is the total length of the shot S and N is the number of micro-segments said shot contains (it may be noted that small values of H(S) correspond to high levels of homogeneity). The distance between two micro-segments s1 and s2 is then the homogeneity of the micro-segments union :

$$d(s_1, s_2) = H(s_1 \cup s_2) \quad (8)$$

The temporal segmentation can now be resumed. The initial oversegmentation sub-step 121 allows to oversegment the concerned shot in order to obtain a set of perfectly homogeneous micro-segments, which corresponds to the following relation (9) :

$$H(s) = 0, \text{ whatever s included in S} \quad (9)$$

An example of how to obtain this initial oversegmented partition is shown in Fig.4 (the axes of which indicate the frame number and the corresponding motion type), with motion types panleft (PL), zoomout (ZO) and fixed (FIX), s_1 to s_7 designating the micro-segments (camera motion parameters may be unknown for some frames : in this example, the last frames of the shot - the micro-segment s_7 - do not have any parameter associated).

The merging sub-step 122 comprises first a computation operation, in which the distance between all neighbouring micro-segments (temporally connected) is computed using the equation (8) for selecting the closest pair of micro-segments (for possible merging during the next operation), and a fusion decision operation, in which, in order to decide if the selected pair of micro-segments will be merged, the homogeneity of the shot (according to the equation (7)) is computed, assuming that the minimum distance micro-segments have already been merged. The following fusion criterion is applied :

merge if $H(S) \leq$ threshold T(H)

do not merge if $H(S) >$ threshold T(H)

(this fusion criterion is global : the decision depends on the homogeneity of the resulting partition, and not exclusively on the homogeneity of the resulting micro-segment). If the merging is done, a new iteration starts at the level of the second sub-step (a second computation operation is then carried out, and so on...). The merging process ends when there is no pair of neighbouring micro-segments that can still be merged.

The third step 13, a shot clustering one provided for merging groups of consecutive shots into more coherent entities, is divided into two sub-steps : a shot merging sub-step 131, in which pairs of shots are grouped together for creating a binary tree, and a tree structuring sub-step 132, for restructuring said binary tree in order to reflect the similarity present in the video sequence.

The shot merging sub-step 131 is provided for yielding a binary tree which represents the merging order of the initial shots : the leaves represent these initial shots, the top node the whole sequence, and the intermediate nodes the sequence that are created by the merging of several shots. The merging criterion is defined by a distance between shots, and the closest shots are first merged. In order to compute the distance between shots, it is necessary to define a shot model providing the features to be compared and to set the neighbourhood links between them (which indicate what merging can be done). The process ends when all the initial shots have been merged into a single node or when the minimum distance between all couples of linked nodes is greater than a specified threshold.

The shot model must obviously allow to compare the content of several shots, in order to decide what shots must be merged and which is their merging order. In still images, luminance and chrominance are the main features of the image, while in a video sequence motion is an importance source of information due to the temporal evolution. So, average images, histograms of luminance and chrominance information (YUV components) and motion information will be used to model the shots.

For implementing the shot merging sub-step 131, it is necessary to carry out the five following operations : (a) to get a minimum distance link (operation 1311), (b) to check a distance criterion (operation 1312) ; (c) to merge nodes (operation 1313) ; (d) to update links and distances (operation 1314) ; (e) to check the top node (operation 1315).

In the operation 1311, both the minimum and the maximum distance are computed for every pair of linked nodes. The maximum distance is first checked : if it is higher than a maximum distance threshold d(max), the link is discarded, otherwise the link is taken into account. Once all links have been scanned, the minimum distance is obtained.

In the operation 1312, in order to decide if the nodes pointed by the minimum distance link must be merged, the minimum distance is compared to a minimum distance threshold d(min) : if it is higher than said threshold, no merging is performed and the process ends, otherwise pointed nodes are merged and the process goes on.

In the operation 1313, nodes pointed by the minimum distance links are merged. In the operation 1314, said links are updated to take into account the merging that has been done and, once links have been updated, the distance of those links which point to the new mode is recomputed. In the final operation 1315, the number of remaining nodes is checked : if all initial shots have been merged into a single node, the process ends, otherwise a new iteration begins.

The shot merging sub-step 131 may yield a single tree if all the initial shots are similar enough or a forest if initial shots are quite different. An example of binary tree for the creation of a table of contents is shown in Fig.5. Inside the leaf nodes of this tree, its label and, between brackets, the starting and ending frame numbers of the shot have been indicated; inside the remaining nodes, the label, the fusion order (between parenthesis) and the minimum and maximum distance between its two siblings.

The tree restructuring sub-step 132 is provided for restructuring the binary tree obtained in the sub-step 131 into an arbitrary tree that should reflect more clearly the video structure. To this end, it is decided to remove the nodes that have been created by the merging process but that do not convey any relevant information, said removal being done according to a criterion based on the variation of the similarity degree (distance) between the shots included in the node :

- if the analyzed node is the root node (or one of the root nodes if various binary trees have been obtained after the merging process), then the node is preserved, and it will appear in the final tree ;

- if the analyzed node is a leaf node (i.e. corresponds to an initial shot), then it has also to remain in the final tree ;

- otherwise, the node will be kept in the final tree only if the following conditions (10) and (11) are satisfied :

$$|d(\min)[\text{analyzed node}] - d(\min)[\text{parent node}]| < T(H) \qquad (10)$$

$$|d(\max)[\text{analyzed node}] - d(\max)[\text{parent node}]| < T(H) \qquad (11)$$

As shown in Fig.6, the tree resulting from the restructuring sub-step 132 represents more clearly the structure of the video sequence : nodes in the second level of the hierarchy (28,

12, 13, 21) represent the four scenes of the sequence, while nodes in the third (or occasionally in the fourth) level represent the initial shots.

The invention is not limited to the implementation described above, from which modifications or broader applications may be deduced without departing from the scope of the invention. For instance the invention also relates to a method for indexing data that have been processed according to the previously described method. Such a method, illustrated in Fig.7, comprises a structuring step 71, carrying out a sub-division of each processed sequence into consecutive shots and the splitting of each of the obtained shots into sub-entities (or micro-segments), and a clustering step 72, creating the final hierarchical structure. These steps 71 and 72, respectively similar to the steps 11-12 and to the step 13 previously described, are followed by an additional indexing step 73, provided for adding a label to each element of the hierarchical structure defined for each processed video sequence.

The invention also relates to an image retrieval system such as illustrated in Fig.8, comprising a camera 81, for the acquisition of the video sequences (available in the form of sequential video bitstreams), a video indexing device 82, for carrying out said data indexing method (said device captures the different levels of content information in said sequences by analysis, hierarchical segmentation, and indexing on the basis of the categorization resulting from said segmentation), a database 83 that stores the data resulting from said categorization (these data are sometimes called metadata), a graphical user interface 84, for carrying out the requested retrieval from the database, and a video monitor 85 for displaying the retrieved information (the invention also relates, obviously, to the video indexing device 82, that allows to implement the method according to the invention).

CLAIMS:

1. A method for an automatic extraction of the structure of a video sequence that corresponds to successive frames, comprising the following steps :

(1) a shot detection step, provided for detecting the boundaries between consecutive shots, a shot being a set of contiguous frames without editing effects ;

(2) a partitioning step, provided for splitting each shot into sub-entities, called micro-segments ;

(3) a clustering step, provided for creating a final hierarchical structure of the processed video sequence.

2. A method according to claim 1, wherein said shot detection step uses a similarity criterion based on a computation of the mean displaced frame difference curve and the detection of the highest peaks of said curve.

3. A method according to anyone of claims 1 and 2, wherein said sub-division step uses a criterion involving the level of homogeneity on the motion parameters of the camera used to generate the processed video sequence.

4. A method according to claim 3, wherein the homogeneity of a micro-segment is computed on a motion histogram, each bin of which shows the percentage of frames with a specific type of motion.

5. A method according to claim 4, wherein, if the bins of the histogram are not equal to either 1 or 0, i.e. present intermediate values indicating that a micro-segment is not perfectly homogeneous, a distance between two micro-segments is computed, based on the homogeneity of the micro-segments union, said homogeneity being itself deduced from the histogram of a micro-segment and the different motion types, the homogeneity of a shot being equal to the homogeneity of its micro-segments weighted by the length of each of them, a fusion between any pair of micro-segments being decided or not according to the value of the homogeneity of the shot with respect to a predefined threshold T(H) and

assuming that the selected micro-segments have already been merged, and such a possible merging process between micro-segments ending when there is no further pair of neighbouring micro-segments that can be merged.

6. A method for indexing data available in the form of a video sequence that corresponds to successives frames, comprising the following segmentation steps :

(1) a structuring step, provided for sub-dividing said sequence into consecutive shots and splitting each of said shots into sub-entities called micro-segments ;

(2) a clustering step, provided for creating on the basis of said segmentation a final hierarchical structure of the processed video sequence ;

(3) an indexing step, provided for adding a label to each element of said hierarchical structure.

7. A video indexing device including means for carrying out a method according to claim 6.

8. An image retrieval system including :

(1) means for carrying out a method according to claim 6, for defining in a hierarchical fashion the structure of a video sequence that corresponds to successive frames, giving an indexing label to each element of the hierarchical structure thus defined, and storing said labels ;

(2) means for performing on the basis of the stored labels any image retrieval using one or several features of said image to be retrieved.

ABSTRACT:

The invention relates to a method intended to automatically create a description of a video sequence - i.e. its table of contents - by means of an analysis of said sequence. The main step of said method is a temporal segmentation of the video shots of the sequence, using camera motion parameters. This segmentation uses a similarity criterion involving, for sub-entities of each shot, the level of homogeneity of these sub-entities on the motion parameters of the camera used to acquire the original images and generate the bitstream constituting the processed sequence.

Fig.2

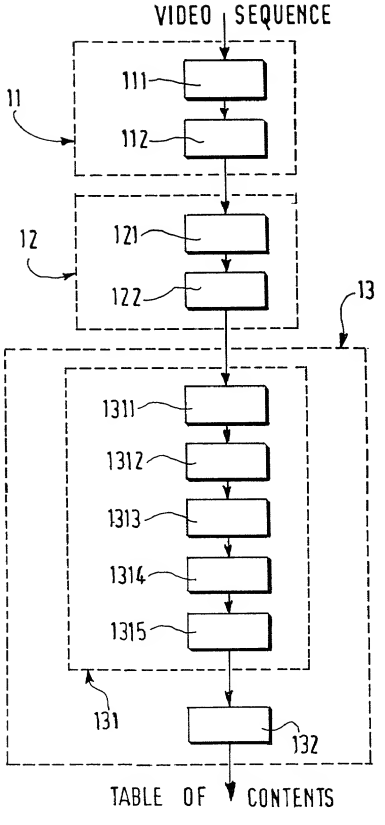
VIDEO SEQUENCE
11
111
112
12
121
122
13
1311
1312
1313
1314
1315
131
132
TABLE OF CONTENTS

FIG.1

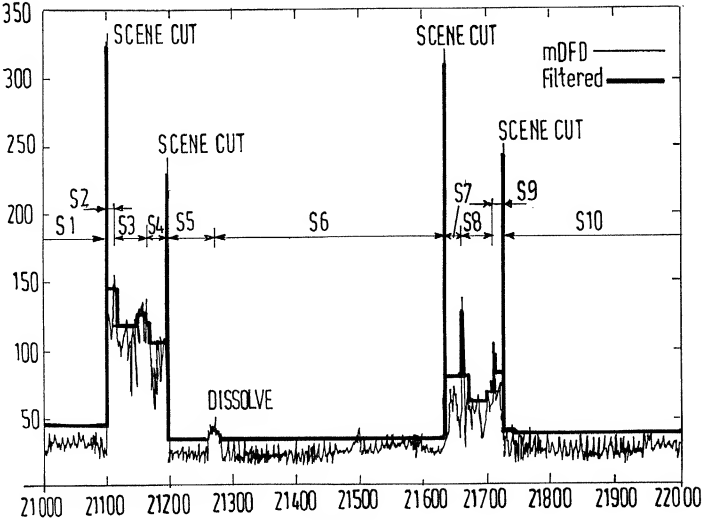

FIG.2

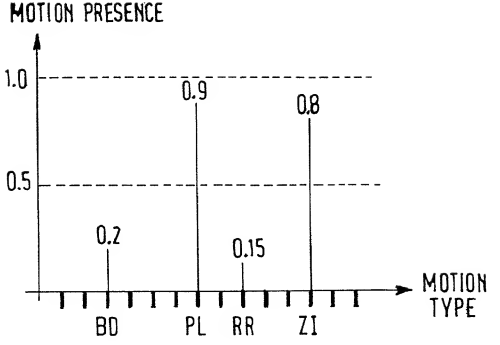
MOTION PRESENCE
1.0
0.5
0.9
0.8
0.2
0.15
BD
PL
RR
ZI
MOTION TYPE

FIG.3

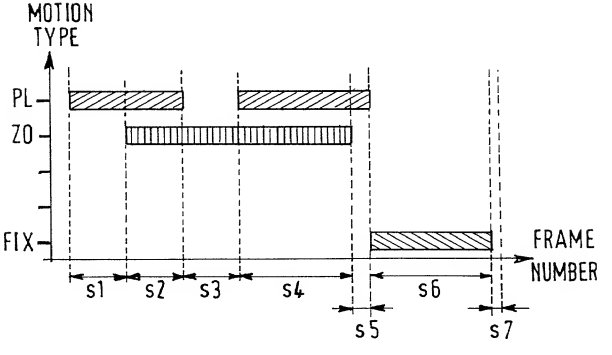
MOTION TYPE
PL
ZO
FIX
FRAME NUMBER
s1
s2
s3
s4
s5
s6
s7

FIG.4

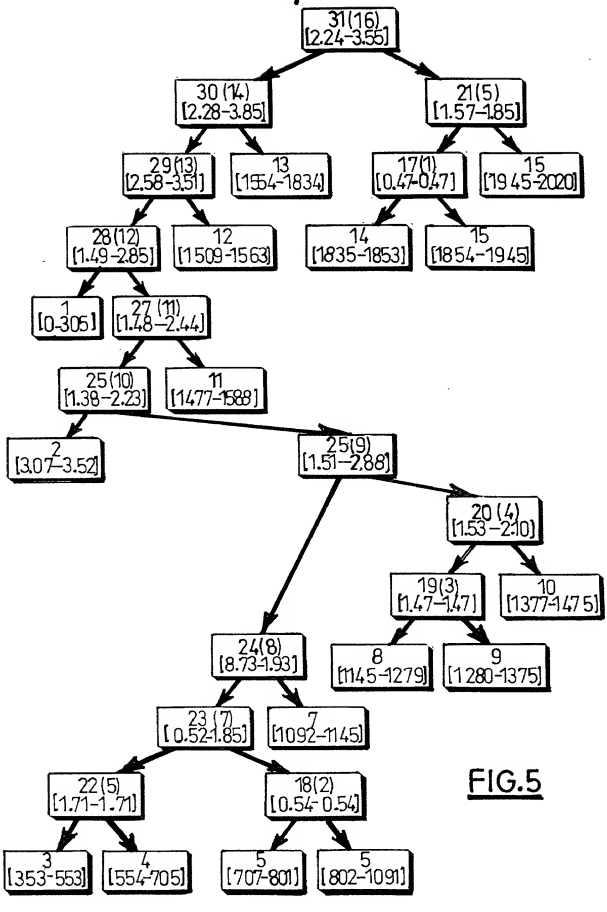

FIG.5

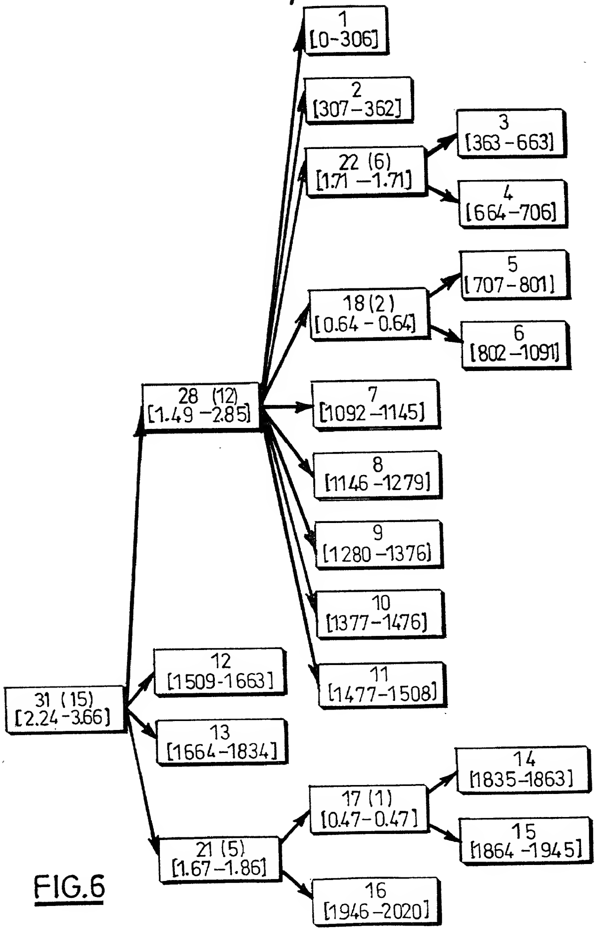

FIG.6

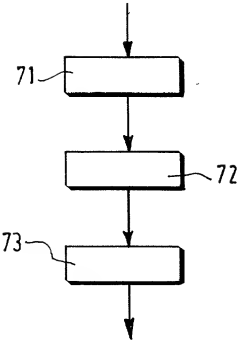

FIG. 7

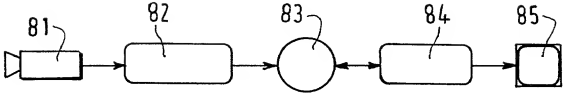

FIG. 8

DECLARATION and POWER OF ATTORNEY

ATTORNEY'S DOCKET NO.:
PHF 99.593 US

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled
"Automatic extraction method of the structure of a video sequence"
the specification of which (check one)

☐ is attached hereto.
☐ was filed on _____ as Application Serial No. _____ and was amended on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by the amendment(s) referred to above.

I acknowledge the duty to disclose information which is material to patentability of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, § 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

PRIOR FOREIGN APPLICATION(S)

COUNTRY	APP. NUMBER	DATE OF FILING (DATE, MONTH, YEAR)	PRIORITY CLAIMED UNDER 35 U.S.C. 119
Europe	**99401684.8**	**06 July 1999**	**YES**
Europe	**99402594.8**	**20 October 1999**	**YES**

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35 United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

PRIOR UNITED STATES APPLICATION(S)

APPLICATION SERIAL NUMBER	FILING DATE	STATUS (PATENTED, PENDING, ABANDONED)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. (list name and registration number)

Algy Tamoshunas, Reg. No. 27,677
Jack E. Haken, Reg. No. 26,902

SEND CORRESPONDENCE TO: Corporate Patent Counsel;	DIRECT TELEPHONE CALLS TO:
U.S. Philips Corporation; 580 white Plains Road;	(name and telephone No.)
Tarrytown, NY 10591	(914) 332-0222

Dated:		Inventor's Signature:		
Full Name of in Inventor	Last Name **LLACH-PINSACH**	First Name **Joan**	Middle Name	
Residence & Citizenship	City **Barcelona**	State of Foreign Country **Spain**	Country of Citizenship **Spain**	
Post Office Address	Street **c/Mineria 54-56, Esc.A, Ar.1**	City **08004 Barcelona**	State of Country **Spain**	Zip Code
Dated:		Inventor's Signature:		
Full Name of in Inventor	Last Name **SALEMBIER**	First Name **Philippe**	Middle Name	
Residence & Citizenship	City **Esplugas**	State of Foreign Country **Spain**	Country of Citizenship **France**	
Post Office Address	Street **Emili Juncadella 15-17, 2°**	City **08950 Esplugas - Barcelona**	State of Country **Spain**	Zip Code

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of | Atty. Docket

JOAN LLACH-PINSACH ET AL | PHF 99,593

Serial No. | Group Art Unit

Filed: CONCURRENTLY | Ex.

AUTOMATIC EXTRACTION METHOD OF THE STRUCTURE OF A VIDEO SEQUENCE
Honorable Commissioner of Patents and Trademarks
Washington, D.C. 20231

APPOINTMENT OF ASSOCIATES

Sir:

The undersigned Attorney of Record hereby revokes all prior appointments (if any) of Associate Attorney(s) or Agent(s) in the above-captioned case and appoints:

RUSSELL GROSS **(Registration No. 40,007)**

MICHAEL E. MARION **(Registration No. 32,266)**

c/o U.S. PHILIPS CORPORATION, Intellectual Property Department, 580 White Plains Road, Tarrytown, New York 10591, his Associate Attorney(s)/Agent(s) with all the usual powers to prosecute the above-identified application and any division or continuation thereof, to make alterations and amendments therein, and to transact all business in the Patent and Trademark Office connected therewith.

ALL CORRESPONDENCE CONCERNING THIS APPLICATION AND THE LETTERS PATENT WHEN GRANTED SHOULD BE ADDRESSED TO THE UNDERSIGNED ATTORNEY OF RECORD.

Respectfully,

Algy Tamoshunas, Reg. 27,677
Attorney of Record

Dated at Tarrytown, New York
this 5th day of JULY 2000.

MW05GRGO.SW0

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of	Atty. Docket
JOAN LLACH-PINSACH ET AL	PHF 99,593
Serial No.	Group Art Unit
Filed: CONCURRENTLY	Ex.

AUTOMATIC EXTRACTION METHOD OF THE STRUCTURE OF A VIDEO SEQUENCE
Honorable Commissioner of Patents and Trademarks
Washington, D.C. 20231

CITATION OF RELATED CASES

Sir:

Attached is a report which was made by the assignee of the above-identified patent application.

The United States patent applications and issued patents identified in this report may be relevant to the examination of the above-identified patent application inasmuch as they have been identified by an automated search of the assignee's patent portfolio files as having common inventors with and/or subject matter which is classified by the assignee in the same technological field as the above-identified patent application. However, citation of this report is neither an admission that any document noted therein is prior art to the above-identified patent application nor a waiver of the confidential status of any listed patent application under 35 U.S.C. 122.

Respectfully submitted,

By _____
Michael E. Marion, Reg. 32,266
Attorney
(914) 333-9641

MW05GRH0.SW0

Related Cases/Technology Report for PHF 99593

LLACH-PINSACH, JOAN
SALEMBIER, PHILIPPE

Docket No.: PHF 99593
Patent No.:
OS Codes : DV1100
Title : AUTOMATIC EXTRACTION METHOD OF THE STRUCTURE OF A SEQUENCE.

Attorney: UNASSIGNED
Serial No.:

Common Inventors

LAMNABHI, MOUSTANIR
SALEMBIER, PHILIPPE

Docket No.: PHF 87516
Patent No.: 4860310
OS Codes : DV5100
Title : DUOBINARY ENCODED SIGNAL DECODER

Attorney: MARION
Serial No.: __/164620

SALEMBIER, PHILIPPE
LAMNABHI, MOUSTANIR

Docket No.: PHF 87561
Patent No.: 4879729
OS Codes : BN5500
Title : APPARATUS FOR THE DECODING CODED FREQUENCY

Attorney: LOBATO
Serial No.: __/223459

SALEMBIER, PHILIPPE
HAYET, PASCAL

Docket No.: PHF 88618
Patent No.: 5036388
OS Codes : TV4800
Title : APPARATUS INCLUDING AN IMPROVED DEVICE FOR D.C. COMPONENT.

Attorney: GOODMAN
Serial No.: __/431499

SALEMBIER, PHILIPPE

Docket No.: PHF 95543
Patent No.:
OS Codes : DV1000
Title : METHOD AND SYSTEM FOR CODING AN IMAGE SEQUENCE, CODED SIGNAL AND STORAGE MEDIUM, AND METHOD AND

Attorney: GATHMAN
Serial No.: 08/688917

SALEMBIER, PHILIPPE

Docket No.: PHF 95553
Patent No.:
OS Codes : DV1000
Title : METHOD AND SYSTEM FOR CODING A SEQUENCE OF CORRESPONDING CODED SIGNAL AND STORAGE MEDIUM,

Attorney: GATHMAN
Serial No.: 08/709498

SALEMBIER, PHILIPPE

Docket No.: PHF 95553A
Patent No.:
OS Codes : DV1000
Title : METHOD AND SYSTEM FOR CODING A SEQUENCE OF CORRESPONDING CODED SIGNAL AND STORAGE MEDIUM,

Attorney: GATHMAN
Serial No.: 08/709498

SALEMBIER, PHILIPPE

Docket No.: PHF 95553B
Patent No.:
OS Codes : DV1000
Title : METHOD AND SYSTEM FOR CODING A SEQUENCE OF CORRESPONDING CODED SIGNAL AND STORAGE MEDIUM,

Attorney: GATHMAN
Serial No.: 08/709498

CORSET, ISABELLE
BOUCHARD, LIONEL
JEANNIN, SYLVIE
SALEMBIER, PHILIPPE

Docket No.: PHF 96542
Patent No.:
OS Codes : DV1000
Title : SEGMENTED PICTURE CODING METHOD AND SYSTEM, AND DECODING METHOD AND SYSTEM.

Attorney: GATHMAN
Serial No.: 08/736771

CORSET, ISABELLE
BOUCHARD, LIONEL
JEANNIN, SYLVIE
SALEMBIER, PHILIPPE

Docket No.: PHF 96542A
Patent No.: 5995668
OS Codes : DV1000
Title : SEGMENTED PICTURE CODING METHOD AND SYSTEM, AND DECODING METHOD AND SYSTEM.

Attorney: GATHMAN
Serial No.: 08/736771

PARDAS, MONTSE
SALEMBIER, PHILIPPE
AYSO, FRANCISCO X.
MARTI, EVA

Docket No.: PHF 96545
Patent No.:
OS Codes : DV1000
Title : VIDEO CODING METHOD AND CORRESPONDING CODING AND SYSTEMS.

Attorney: GROSS
Serial No.: 08/981811

OLIVERAS, ALBERT
SALEMBIER, PHILIPPE
GARRIDO, LUIS

Docket No.: PHF 96629
Patent No.: 5867605
OS Codes : DV1000
Title : FILTERING METHOD AND CORRESPONDING FILTERING

Attorney: GATHMAN
Serial No.: 08/813415

Related Technology

CHEN, YINGWEI
CHALLAPAHI, KIRAN

Docket No.: PHA 23321
Patent No.: 6067118
OS Codes : DV1100
Title : METHOD OF FRAME-BY-FRAME CALCULATION OF .

Attorney: THORNE
Serial No.: 08/991521

CHALLAPALI, KIRAN
CHEN, YINGWEI

Docket No.: PHA 23401
Patent No.:
OS Codes : DV1100 ST0900
Title : SYSTEM FOR DETECTING REDUNDANT IMAGES IN A VIDEO

Attorney: GROSS
Serial No.: 09/090594

TZOU, SHING-CHI
WANG, ZHIYONG
LEE, JANWUN

Docket No.: PHA 23596
Patent No.:
OS Codes : BN9000 DV1100
Title : ADAPTIVE BUFFER REGULATION SCHEME FOR BANDWIDTH

Attorney: VERDONK
Serial No.: 09/219832

TZOU, SHING-CHI
WANG, SHIYONG
LEE, JANWUN

Docket No.: PHA 23597 **Attorney:** VERDONK
Patent No.: **Serial No.:** 09/220292
OS Codes : BN9000 DV1100
Title : MOTION ANALYSIS BASED BUFFER REGULATION SCHEME.

TZOU, SHING-CHI
WANG, SHIYONG
LEE, JANWUN

Docket No.: PHA 23597A **Attorney:** VERDONK
Patent No.: **Serial No.:** 09/220292
OS Codes : BN9000 DV1100
Title : MOTION ANALYSIS BASED BUFFER REGULATION SCHEME.

BAKHMUTSKY, MICHAEL

Docket No.: PHA 23623 **Attorney:** GROSS
Patent No.: **Serial No.:** 09/263921
OS Codes : DV1100
Title : BLOCK MATCHING MOTION ESTIMATION USING REDUCED CLUSTERED PREDICTIONS.

KRISHNAMACHARI, S.

Docket No.: PHA 23640 **Attorney:** GROSS
Patent No.: **Serial No.:** 09/281353
OS Codes : DV1100
Title : IMAGE COMPRESSION USING CONTENT-BASED IMAGE

BAKHMUTSKY, MICHAEL

Docket No.: PHA 23651 **Attorney:** GROSS
Patent No.: **Serial No.:** 09/287160
OS Codes : DV1100
Title : MOTION ESTIMATION METHOD FEATURING ORTHOGONAL-SUM MULTI-MATCHING.

BAKHMUTSKY, MICHAEL

Docket No.: PHA 23652 **Attorney:** GROSS
Patent No.: **Serial No.:** 09/287161
OS Codes : DV1100
Title : MOTION ESTIMATION METHOD USING ORTHOGONAL-SUM

BAKHMUTSKY, MICHAEL
GORNSTEIN, VIKTOR

Docket No.: PHA 23653 **Attorney:** GROSS
Patent No.: **Serial No.:** 09/287165
OS Codes : DV1100
Title : RAM-BASED SEARCH ENGINE FOR ORTHOGONAL-SUM BLOCK SYSTEM.

KURAPATI, KAUSHAI

Docket No.: PHA 23703 **Attorney:** PIOTROWSKI, T
Patent No.: **Serial No.:** 09/345340
OS Codes : DV1100
Title : HIERARCHICAL FOVEATION BASED ON WAVELETS.

KRISHNAMACHARI, S.

Docket No.: PHA 23823 **Attorney:** GATHMAN
Patent No.: **Serial No.:** 09/433507
OS Codes : DV1100
Title : IMPROVE3D CASCADED COMPRESSION METHOD AND SYSTEM VIDEO AND IMAGES.

RADHA, HAYDER
LOGUINOV, DMITRI

Docket No.: PHA 23831 **Attorney:** GROSS
Patent No.: **Serial No.:** 09/440622
OS Codes : HN1120 DV1100
Title : SYSTEM AND METHOD FOR CONTROLLING THE DELAY DECODER BUFFER IN A STREAMING DATA RECEIVER.

RADHA, HAYDER
VAN DER SCHAAR, MIHAELA
CHEN, YINGWEI

Docket No.: PHA 23852 **Attorney:** GROSS
Patent No.: **Serial No.:** 09/590825
OS Codes : DV1100
Title : HYBRID TEMPORAL-SNR FINE GRANULAR SCALABILITY

FERT, ETIENNE
KAISER, DANIEL

Docket No.: PHF 98524 **Attorney:** GROSS
Patent No.: **Serial No.:** 09/124674
OS Codes : DV1100
Title : VARIABLE BITRATE VIDEO CODING METHOD AND CODER.

FERT, ETIENNE
KAISER, DANIEL

Docket No.: PHF 98560 **Attorney:** GROSS
Patent No.: **Serial No.:** 09/121574
OS Codes : DV1100
Title : VARIABLE BITRATE VIDEO CODING METHOD AND CODER.

BAILLEUL, NICOLAS

Docket No.: PHF 98574 **Attorney:** GROSS
Patent No.: **Serial No.:** 09/300698
OS Codes : DV1100
Title : DATA COMPRESSION.

BAILLEUL, NICOLAS
FERT, ETIENNE
GAUTIER, PIERRE

Docket No.: PHF 98577 **Attorney:** GROSS
Patent No.: **Serial No.:** 09/508303
OS Codes : DV1100
Title : BIT-RATE MODIFICATION.

MARTIN, FRANCOIS

Docket No.: PHF 98581 **Attorney:** GROSS
Patent No.: **Serial No.:** 09/244841
OS Codes : DV1100
Title : METHOD OF SWITCHING OF CODED VIDEO SEQUENCES AND CORRESPONDING DEVICE.

ANDRY, LAURENCE

Docket No.: PHF 98605 **Attorney:** GROSS
Patent No.: **Serial No.:** 09/253084
OS Codes : DV1100
Title : METHOD AND DEVICE FOR CODING A SEQUENCE OF

BOISSY, JEAN-CHRISTOPHE
HERLIN, VALERIE

Docket No.: PHF 98615 **Attorney:** GROSS
Patent No.: **Serial No.:** 09/447539
OS Codes : DV1100
Title : SIGNAL PROCESSING.

GROLIERE, FRANCOISE
BARRAU, ERIC

Docket No.: PHF 98625 **Attorney:** GROSS
Patent No.: **Serial No.:** 09/470870
OS Codes : DV1100 BN9000
Title : METHOD AND DEVICE FOR ENCODING A VIDEO SIGNAL.

MORY, BENOIT

Docket No.: PHF 99503 **Attorney:** GROSS
Patent No.: **Serial No.:** 09/478474
OS Codes : DV1100
Title : CAMERA MOTION PARAMETERS ESTIMATION METHOD.

MORY, BENOIT

Docket No.: PHF 99507 **Attorney:** GROSS
Patent No.: **Serial No.:** 09/494670
OS Codes : DV1100
Title : DESCRIPTOR FOR A VIDEO SEQUENCE AND IMAGE USING SAID DESCRIPTOR.

MARQUES, FERRAN
GOMILA, CRISTINA
GASULL, ANTONI

Docket No.: PHF 99511 **Attorney:** GROSS
Patent No.: **Serial No.:** 09/406651
OS Codes : DV1100
Title : PARTITION CODING METHOD AND DEVICE.

COUGNARD, CECILE
ROSHE, DENIS

Docket No.: PHF 99521 **Attorney:** GROSS
Patent No.: **Serial No.:** 09/531687
OS Codes : DV1100
Title : VIDEO CODING METHOD AND CORRESPONDING VIDEO

HERRMANN, LAURENT

Docket No.: PHF 99530 **Attorney:** GROSS
Patent No.: **Serial No.:** 09/553605
OS Codes : DV1100
Title : PREPROCESSING METHOD FOR ADAPTING MPEG-4 DATA INTERNET NETWORK.

SNOOK, DANIEL
GOBERT, JEAN

Docket No.: PHF 99531 **Attorney:** GROSS
Patent No.: **Serial No.:** 09/558775
OS Codes : DV1100
Title : LOW BIT RATE VIDEO CODING METHOD AND SYSTEM.

SNOOK, DANIEL
GROLIERE, FRANCOISE
GOBERT, JEAN

Docket No.: PHF 99532 **Attorney:** GROSS
Patent No.: **Serial No.:** 09/559896
OS Codes : DV1100
Title : VIDEO ENCODING METHOD AND SYSTEM.

FERT, ETIENNE

Docket No.: PHF 99545 **Attorney:** GROSS
Patent No.: **Serial No.:** 09/575608
OS Codes : DV1100
Title : DIGITAL VIDEO SIGNALS CODING METHOD AND OR TRANSCODING SYSTEM.

BOUTROUX, VINCENT
BONNET, MICHEL

Docket No.: PHF 99550 **Attorney:** GROSS
Patent No.: **Serial No.:** 09/366696
OS Codes : DV1100
Title : STATIC IMAGE GENERATION METHOD AND DEVICE.

BONNET, MICHEL
SANS ESTRADA, ORIOL

Docket No.: PHF 99555 **Attorney:** GROSS
Patent No.: **Serial No.:** 09/366695
OS Codes : DV1100
Title : STATIC IMAGE GENERATION METHOD AND DEVICE.

BONNET, MICHEL A.
SANS ESTRADA, ORIOL

Docket No.: PHF 99557 **Attorney:** GROSS
Patent No.: **Serial No.:** 09/366697
OS Codes : DV1100
Title : STATIC IMAGE GENERATION METHOD AND DEVICE.

BAILLEUL, NICOLAS
FERT, ETIENNE
GAUTIER, PIERRE
GRANDCHAMP, MYRIAM

Docket No.: PHF 99559 **Attorney:** GROSS
Patent No.: **Serial No.:** 09/508302
OS Codes : DV1100
Title : DATA COMPRESSION ASSEMBLY SEVERAL

BRULS, WILHELMUS H.
KLEIN GUNNEWIEK, R.

Docket No.: PHN 16834 **Attorney:** GROSS
Patent No.: **Serial No.:** 09/315081
OS Codes : DV1100 DV0200
Title : ENCODING BLOCK-ORGANIZED DATA.

OLIVIERI, STEFANO

Docket No.: PHN 17446 **Attorney:** GROSS
Patent No.: **Serial No.:** 09/455662
OS Codes : DV1100 TV4400
Title : MOTION VECTOR ESTIMATION.

OLIVIERI, STEFANO

Docket No.: PHN 17513 **Attorney:** GROSS
Patent No.: **Serial No.:** 09/477219
OS Codes : DV1100
Title : CODING AND NOISE FILTERING AN IMAGE SEQUENCE.